(0095)

Table 6

example	composition of raw powder					sintering condition	chemical analysis data of sintered body				Sm2O3 converted content	Al2O3 calculated content	TiN converted content	Sm2O3 / Al2O3
	AlN powder		Sm2O3 Added Amount mol %	Al2O3 Added Amount mol %	TiO2 Added Amount mol %	sintering temperature								
	type	oxygen content weight%				℃	O oxygen content weight%	Sm content weight%	Ti content weight%	C content weight%	mol%	mol%	mol%	molar ratio
15	B	0.87	0.23	—	0.05	1800	0.98	1.41	0.056	0.031	0.198	0.666	0.050	0.298
16	B	0.87	0.23	—	0.05	1900	0.69	1.06	0.054	0.029	0.148	0.455	0.047	0.325
17	B	0.87	0.23	—	0.26	1800	1.14	1.44	0.28	0.03	0.204	0.807	0.249	0.252
18	B	0.87	0.23	—	0.26	1900	0.86	1.07	0.27	0.028	0.150	0.605	0.238	0.248
19	B	0.87	0.23	—	0.26	1950	0.74	0.91	0.26	0.027	0.127	0.520	0.228	0.244
20	B	0.87	0.35	0.43	0.25	1800	1.65	1.92	0.26	0.029	0.276	1.209	0.235	0.228
21	B	0.87	0.35	0.43	0.25	1900	1.42	1.62	0.26	0.028	0.231	1.038	0.233	0.223

Table 7

example	properties of sintered body									
	open porosity (%)	bulk density g/cm3	resistivity (25 ℃) Ω・cm	resistivity (300℃) Ω・cm	activation energy eV	bending strength MPa	thermal conductivity W/mK	average grain diameter of AlN μm	color tone (lightness)	crystalline phase (excluding AlN)
15	0.01	3.30	4E+11	4E+08	0.37	441	104	4	black(N-4)	SmAlO3,SmAl11O18,TiN
16	0.02	3.28	6E+10	8E+07	0.35	385	126	6	black (N-4)	SmAlO3,SmAl11O18,TiN
17	0.04	3.30	5E+10	1E+08	0.33	455	101	4	black (N-3)	SmAlO3,SmAl11O18,TiN
18	0.03	3.29	3E+10	7E+07	0.32	472	117	6	black (N-4)	SmAlO3,SmAl11O18,TiN
19	0.03	3.28	1E+10	2E+07	0.33	415	123	7	black (N-4)	SmAlO3,SmAl11O18,TiN
20	0.01	3.33	2E+10	3E+07	0.35	443	99	4	black (N-4)	SmAlO3,SmAl11O18,TiN
21	0.04	3.30	9E+09	2E+07	0.33	376	102	6	black (N-4)	SmAlO3,SmAl11O18,TiN

The surface color of each of aluminum nitride sintered bodies according to the examples 15 to 21 was blackish, uniform, and had a lightness of about N3 to N4. It was possible to prevent color irregularity and to obtain uniform color tone within sintering temperature range of 1800 ℃ to 1950 ℃.

The resistivity of each of sintered bodies according to the examples 15 to 21 was similar to that of the sintered body according to the example 7 without TiO2 addition. In other words, each of the above sintered bodies provided a low volume resistivity and low activation energy of temperature dependency of volume resistivity. Although the resistivity was slightly decreased as the sintering temperature becomes higher, the activation energy was not substantially affected.

The strength, thermal conductivity and mean grain diameter of each sintered body were substantially same as those of the inventive sintered body without the addition of the blackening agent. The grain diameter tends to be larger when applying a higher sintering temperature.

Other than AlN phase, SmAlO3 phase and SmAl11O18 phase were identified as Sm containing phases, and TiN phase was identified as Ti containing phase. An unidentified small peak was distinguished.

It was confirmed that the Ti containing phase was present in intergranular phase between AlN particles as isolated phase with a diameter of not higher than 3 μm, based on the analysis of microstructure by EPMA and backscattering electron images. The distribution of Ti containing phase within the Sm intergranular phase, as well as that within the AlN particles, were not determined. The distribution of Sm containing phase was substantially same as that in Fig. 6, forming network microstructure along the intergranular phase between the AlN particles.

(Experiment "D" : Examples 22 to 33 and comparative examples 9